Transcutaneous Puncture of the Superior Ophthalmic Vein for Embolization of Dural Carotid-Ophthalmic Fistula

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Summary

Carotid-ophthalmic fistula is a rare disease, which can be treated by transvenous endovascular embolization. Here, we report a unique case with draining vein thrombosed, making a transvenous approach impossible. An old but valuable technique, direct transcutaneous puncture of the superior ophthalmic vein, was used to save the patient's right eye. The old technique, direct puncture of the superior ophthalmic vein, retains its irreplaceable usefulness in this special situation. Thus, interventional neuroradiologists should equip themselves with this essential technique.

Case Report

A 26-year-old male patient with history of IgA nephropathy and end-stage renal disease under hemodialysis had experienced mild swelling over his right eyelid for one year. Because the swelling always improved after hemodialysis, he did not pay attention to it initially. However, recently he suffered from acute progression with painful swelling, right eye protrusion, red conjunctiva and rapid deterioration of visual acuity. At this stage, the patient was referred to our hospital. Dural carotid-cavernous fistula was considered as the working diagnosis.

Contrast-enhanced MR angiography showed an engorged right superior ophthalmic vein (SOV) but non-visualization of the right cavernous sinus. Digital subtraction angiography (DSA) revealed early opacification and marked engorgement of the right SOV in the arterial phase without opacification of the right cavernous sinus (Figure A). Some tiny feeding arteries from the cavernous portion of the right internal carotid artery (ICA) were noted connecting with the posterior aspect of the right SOV. Right external carotid angiogram showed no abnormal finding. Dural AV fistula with fistula point at the posterior aspect of the right SOV fed by small dural arteries from the cavernous portion of the right ICA was diagnosed. Surprisingly, after opacification of the engorged SOV, stasis of the contrast medium was noted, indicating no subsequent draining vein (Figure B). Considering the history of the patient, recent thrombosis of the draining vein was impressed.

Because the transarterial and transvenous approaches could not be used in this special case, transcutaneous puncture of the right SOV through the orbital cavity for embolization was the only way to save the vision in the patient's right eye. After informed consent was given by the patient, general anesthesia was applied. The right ICA and right SOV were opacified through the right femoral artery approach.

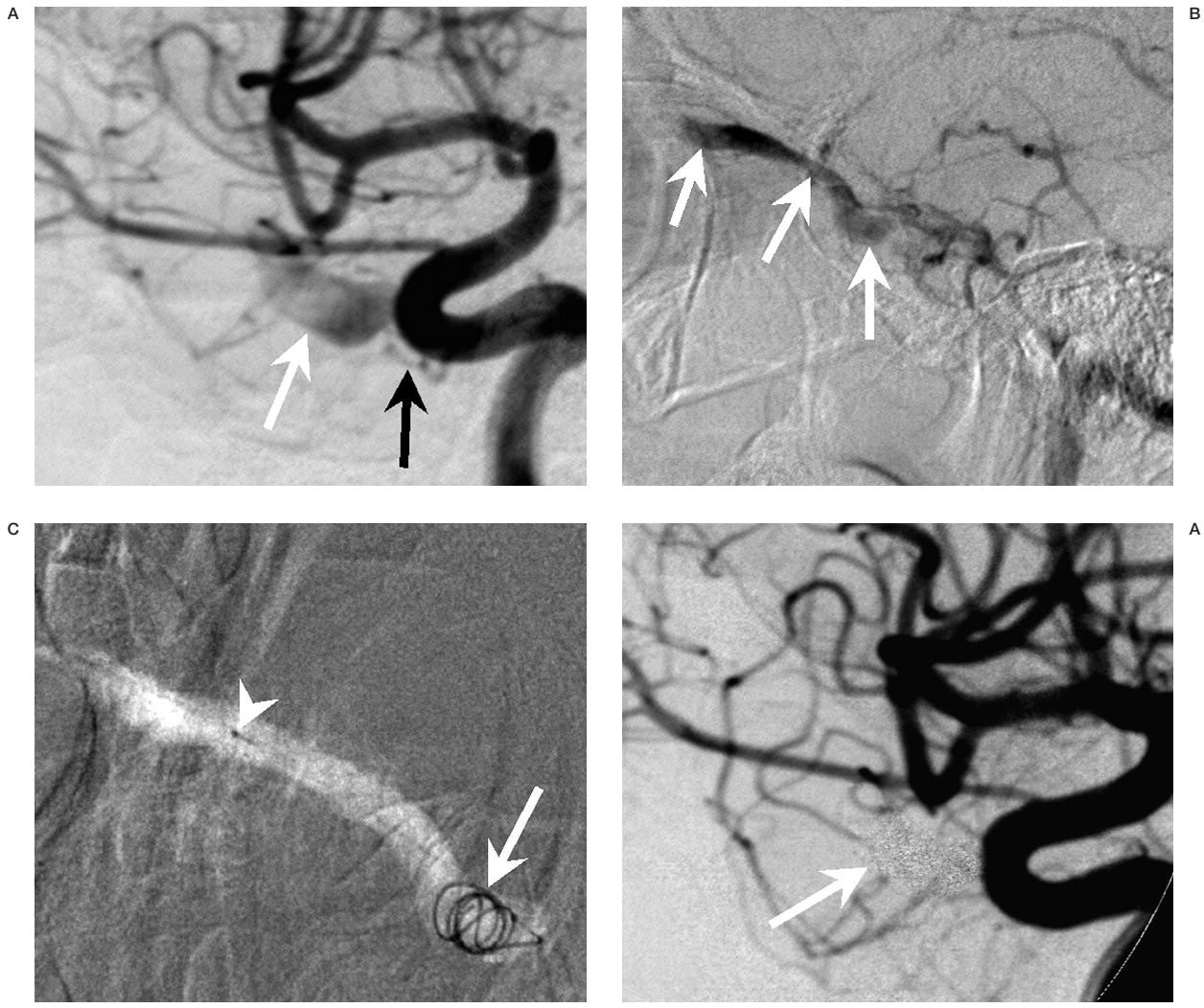

Figure A) The oblique lateral view of magnified right internal carotid angiography during the arterial phase clearly demonstrates the tiny dural arteries (black arrow) from the cavernous portion of the right ICA connecting with the posterior aspect of the right superior ophthalmic vein (white arrow). Due to the tiny size of these arteries, the transarterial approach could not be used. Figure B) The lateral view of right internal carotid angiography during the venous phase shows stasis of the contrast medium in the right superior ophthalmic vein (arrows) without any draining vein. Thus, the transvenous endovascular approach could not be used. Figure C) Lateral view of a digitally subtracted image. Detachable coils (arrrow) were placed into the posterior aspect of the right superior ophthalmic vein through a microcatheter (arrowhead). FigureD) The follow-up right internal carotid angiography shows complete occlusion of the fistula. The noisy signal indicates the digital subtraction artifact (arrow) caused by densely packed coils. Note the difference between Figures A and D.

Then an 18-gauge intravenous sheathed needle was introduced into the right SOV under fluoroscopic guidance with road-map mode (Figure C). After the SOV was accessed, 8 detachable coils, 3 fiber coils and some NBCA/lipiodol 1:1 mixture were used for fistula occlusion. The follow-up right carotid angiography showed complete obliteration of the fistula (Figure D).

After embolization, the patient stated that the painful sensation disappeared within hours. The peri-orbital swelling, eyeball protrusion and visual acuity all improved dramatically the next day. The patient has been symptom free for ten months.

Discussion

Our case clearly demonstrates the irreplaceable usefulness of transcutaneous puncture of the superior ophthalmic vein. Reviewing the

literature, we found that only two cases of carotid-ophthalmic fistula have been reported [1]. These two previously reported patients were successfully treated by transvenous endovascular approach via facial veins [1]. In our patient, the draining veins were already thrombosed, which made the transvenous approach impossible. The transarterial approach to embolize the fistula was considered difficult and dangerous in this case because it is almost impossible to catheterize such tiny feeding arteries arising from the ICA. In addition, the fistula and feeding arteries were very close to the ICA, and if there were any reflux of embolization material into the ICA, embolic stroke would occur. Although stereotactic radiosurgery is a useful alternative method to treat dural arteriovenous fistulae, the improvement of symptoms usually begins 1 to 3 months after the treatment [2,3], which would have been too late for vision rescue in the present case. Due to acute deterioration of the eye condition, direct transcutaneous catheterization of the superior ophthalmic vein for fistula embolization was the only method to save the vision in the patient's right eye.

Direct puncture or surgically exposed catheterization of the superior ophthalmic vein for carotid-cavernous fistula embolization has been reported in the literature [4-9]. But the reported cases all had draining veins, and the transvenous endovascular approach, such as through the inferior petrosal sinus or facial veins, could be used. Direct puncture in the literature was acting as a better way to treat the patient, but not the only way, as in our case.

The insights of the case are as follows. First, with significant improvement in microcatheter materials and techniques in recent decades, it is possible to treat almost every vascular lesion by either the transarterial or transvenous approach. But in this case, the old technique of direct transcutaneous puncture of the superior ophthalmic vein is still irreplaceable. The puncture technique was developed 20 years ago, but it still retains its usefulness. Second, it is important for interventional neuroradiologists, no matter how good their endovascular technique is, to equip themselves with this essential technique, since it could be the only way to save a patient's vision.

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